CLAIMS

What is claimed is:

- 1. A nanosphere having a diameter less than 300 nanometers, the nanosphere comprising:
 - at least one magnetically responsive nanoparticle having single domain properties; and
 - a bio-compatible shell encapsulating the nanoparticle.
- 2. The nanosphere of claim 1 wherein the at least one magnetically responsive nanoparticle comprises a plurality of magnetically responsive nanoparticles having single domain properties.
- 3. The nanosphere of claim 2 wherein the plurality of single domain magnetically responsive nanoparticles have uniformly aligned magnetic moments.
- 4. The nanosphere of claim 1 wherein the nanoparticle is comprised of a ferrite.
- 5. The nanosphere of claim 1 wherein the nanoparticle is comprised of magnetite.
- 6. The nanosphere of claim 1 wherein the nanoparticle comprises a silica coating.
 - 7. The nanosphere of claim 6 wherein the nanoparticle comprises magnetite.
- 8. The nanosphere of claim 7 further comprising an erodable polymer contained within the bio-compatible shell.

- 9. The nanosphere of claim 1 wherein the bio-compatible shell comprises a biostable polymer.
- 10. The nanosphere of claim 9 wherein the biostable polymer comprises at least one of silica or titania.
- 11. The nanosphere of claim 9 further comprising cell adhesion factors supported on the bio-compatible shell.
- 12. The nanosphere of claim 9 wherein the nanosphere comprises a plurality of single domain magnetically responsive nanoparticles having uniformly aligned magnetic moments.
- 13. The nanosphere of claim 11 wherein the nanoparticles are comprised of magnetite.
- 14. The nanosphere of claim 1 further comprising an erodable polymer matrix encapsulated within the bio-compatible shell.
- 15. The nanosphere of claim 14 further comprising a therapeutic encapsulated within the bio-compatible shell.
- 16. The nanosphere of claim 1 wherein the bio-compatible shell comprises collagen.
- 17. The nanosphere of claim 16 further comprising a therapeutic encapsulated within the bio-compatible shell.
- 18. The nanosphere of claim 17 further comprising an erodable polymer matrix encapsulated within the bio-compatible shell.

- 19. The nanosphere of claim 18 wherein the nanosphere comprises a plurality of single domain magnetically responsive nanoparticles having uniformly aligned magnetic moments.
- 20. The nanosphere of claim 19 wherein the nanoparticle is superparamagnetic.
- 21. The nanosphere of claim 1 wherein the bio-compatible shell comprises an outer surface and wherein the nanosphere further comprises at least one cell adhesion factor supported on the outer surface of the bio-compatible shell.
- 22. The nanosphere of claim 21 wherein the cell adhesion factor comprises a protein having an affinity for a predetermined cell.
 - 23. The nanosphere of claim 1 wherein the nanoparticle is superparamagnetic.

- 24. A nanosphere having a diameter less than 300 nanometers comprising:
- at least one magnetically responsive nanoparticle prepared by a process comprising:

vaporizing a magnetic metal salt;

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oxidizing the vaporized magnetic metal salt to produce an oxidized metal vapor; and

quenching the oxidized metal vapor; and a bio-compatible shell encapsulating the nanoparticle.

- 25. The nanosphere of claim 24 wherein the magnetic metal salt comprises a ferric and ferrous mixture having a ratio of between 2 to 1 and 10 to 1.
- 26. The nanosphere of claim 24 wherein the process further comprises injecting the vaporized magnetic metal salt into a plasma reactor.
- 27. The nanosphere of claim 26 wherein the nanosphere further comprises a plurality of nanoparticles and the process further comprises nucleating the nanoparticles.
- 28. The nanosphere of claim 27 wherein the process further comprises treating the nanoparticles with a bio-compatible surface agent.
- 29. The nanosphere of claim 28 where in the bio-compatible surface agent comprises silicon tetrachloride.
- 30. The nanosphere of claim 28 wherein the quenching the oxidized metal vapor further comprises injecting a cooling gas.
- 31. The nanosphere of claim 30 wherein the process further comprises collecting the nanoparticles using an electrostatic filter.

- 32. The nanosphere of claim 24 wherein the process further comprises introducing silicon tetrachloride to the oxidized metal vapor.
- 33. The nanosphere of claim 24 wherein the nanoparticle is comprised of magnetite.
- 34. The nanosphere of claim 24 wherein the bio-compatible shell is comprised of collagen.
- 35. The nanosphere of claim 34 further comprising an erodable polymer matrix contained within the bio-compatible shell.
- 36. The nanosphere of claim 35 further comprising a therapeutic contained within the bio-compatible shell.

37. A nanosphere having a diameter of less than 300 nanometers comprising: at least one magnetically responsive nanoparticle having single domain properties prepared by a process comprising:

forming a precipitate by mixing a magnetic metal salt and an alkaline media;

magnetically collecting the precipitate; and drying the precipitate;

a bio-compatible shell encapsulating the nanoparticle.

- 38. The nanosphere of claim 37 wherein the magnetic metal salt comprises ferric chloride and ferrous chloride at a ratio of between 2 to 1 and 10 to 1.
- 39. The nanosphere of claim 37 wherein the alkaline media comprises ammonium hydroxide.
- 40. The nanosphere of claim 37 wherein the process of preparing the nanoparticles further comprises washing the precipitate with a solvent.
- 41. The nanosphere of claim 37 wherein drying the precipitate further comprises heating the precipitate.
- 42. The nanosphere of claim 37 wherein the process of preparing the nanoparticles further comprises dispersing the precipitate in an alkaline media.
- 43. The nanosphere of claim 42 wherein the process further comprises reacting the precipitate with sodium silicate.
- 44. The nanosphere of claim 42 wherein the process further comprises reacting the precipitate with a chloride salt.

45. A method for making a magnetically responsive nanoparticle comprising: vaporizing a magnetic-metal salt; oxidizing the vaporized magnetic-metal salt to produce an metal oxide vapor; and quenching the metal oxide vapor to produce at least one nanoparticle of a desired diameter.

46. The method of claim 45 wherein the magnetic metal salt comprises a ferric and ferrous mixture having a ratio of between 2 to 1 and 10 to 1.

- 47. The method of claim 45 wherein the oxidation step is carried out using a plasma reactor.
- 48. The method of claim 47 further comprising treating the surface of the nanoparticle with a bio-compatible surface agent comprising silicon tetrachloride.
- 49. The method of claim 45 further comprising collecting the nanoparticle with an electrostatic filter.

- 50. A method for making a magnetically responsive nanoparticle comprising: forming a precipitate by mixing a magnetic metal salt and an alkaline media; collecting the precipitate using a magnetic field; and drying the precipitate.
- 51. The method of claim 50 wherein the magnetic metal salt comprises a mixture of magnetic metal salts comprising ferric chloride and ferrous chloride at a ratio of between 2 to 1 and 10 to 1.
- 52. The method of claim 50 wherein the alkaline media comprises ammonium hydroxide.
- 53. The method of claim 50 further comprising washing the precipitate with a solvent.
- 54. The method of claim 50 wherein drying the precipitate further comprises heating the precipitate.
 - 55. The method of claim 50 further comprising the steps of: dispersing the precipitate in alkaline media; and reacting the precipitate with sodium silicate.

56. A magnetically responsive nanosphere having a bio-compatible shell, the nanosphere is prepared by a process comprising:

atomizing a nanodispersion wherein the nanodispersion comprises a magnetically responsive nanoparticle and sodium silicate; and

drying the atomized nanodispersion in a magnetic field.

- 57. The nanosphere of claim 56 wherein the nanosphere comprises a plurality of magnetically responsive nanoparticles encapsulated within the bio-compatible shell.
- 58. The nanosphere of claim 57 wherein the nanoparticles comprise magnetite.
- 59. The nanosphere of claim 56 further comprising at least a therapeutic contained within the bio-compatible shell.
- 60. The nanosphere of claim 59 wherein the therapeutic further comprises an erodable matrix.
- 61. The nanosphere of claim 56 wherein the bio-compatible shell comprises an outer surface and wherein the nanosphere further comprises at least one cell adhesion factor supported on the outer surface of the bio-compatible shell.
- 62. The nanosphere of claim 56 wherein the nanoparticle is superparamagnetic.

63. A magnetically responsive nanosphere having a bioerodable shell, the nanosphere is prepared by a process comprising:

atomizing a dilute solution to form a droplet, wherein the dilute solution comprises at least one magnetically responsive nanoparticle, a solvating media, and a bioerodable polymeric material; and

drying the droplet in a magnetic field to remove the solvating media.

- 64. The nanosphere of claim 63 wherein the nanoparticle is comprised of magnetite.
- 65. The nanosphere of claim 63 wherein the dilute solution comprises a plurality of single domain magnetically responsive nanoparticles having uniformly aligned magnetic moments.
- 66. The nanosphere of claim 63 wherein the nanoparticle is superparamagnetic.

- 67. A nanosphere having a diameter of less than 300 nanometers, the nanosphere comprising:
 - a plurality of single domain superparamagnetic magnetite nanoparticles having uniformly aligned magnetic moments;
 - a shell encapsulating each of the plurality of the nanoparticles; and an outer bio-compatible shell encapsulating the nanoparticles.

- 68. The nanosphere of claim 67 wherein the shell encapsulating each of the plurality of the nanoparticles comprises collagen.
 - 69. The nanosphere of claim 67 further comprising:
 a bioerodable polymer matrix contained within the outer bio-compatible shell; and
 a therapeutic contained within the bioerodable polymer matrix.
- 70. The nanosphere of claim 67 wherein the shell encapsulating each of the plurality of nanoparticles comprises silica.
- 71. The nanosphere of claim 70 wherein the outer bio-compatible shell encapsulating the nanoparticles further comprises at least a cell adhesion factor.